

METODA ZA PREPOZNAVANJE PRIHODNIJH OBMOČIJ SUBURBANIZACIJE

A METHOD FOR IDENTIFICATION OF FUTURE SUBURBANISATION AREAS

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IZVLEČEK

V članku je obravnavan pojav suburbanizacije na globalni ravni, na Poljskem in podrobneje v okolici Varšave. Namen študije je analizirati možnosti uporabe informacij o transakcijah komunalno neopremljenih nepozidanih stavbnih zemljišč za prepoznavanje območij prihodnje pospešene suburbanizacije. Za verifikacijo soodvisnosti trga nepremičnin s kasnejšo suburbanizacijo smo izvedli splošno in podrobnejšo raziskavo. Za raziskavo na splošni ravni smo za obdobje 2009–2014 analizirali soodvisnost med skupnim številom transakcij in spremembo površin kmetijskih zemljišč v posameznih katastrskih občinah v okolici Varšave. Za podrobnejšo študijo smo izbrali dve občini, kjer smo za nepozidana stavbna zemljišča, ki so bila predmet transakcije, analizirali čas od transakcije do začetka investicije. Rezultati so pokazali, da je bilo 40 % na novo pozidanih stavbnih zemljišč predmet transakcije kot nepozidanih neopremljenih stavbnih zemljišč v zadnjih treh letih. Približno 30 % analiziranih nepozidanih in neopremljenih stavbnih zemljišč, ki so bila predmet transakcije, je bilo zatem predmet razvoja stavbnih zemljišč v obdobju treh let od transakcije. Na podlagi tega smo ugotovili, da so informacije o trgu nepozidanih stavbnih zemljišč pomembne za napoved suburbanizacije.

KLJUČNE BESEDE

zemljišče, stavbno zemljišče, suburbanizacija, neopremljeno stavbno zemljišče, promet nepremičnin

ABSTRACT

The article describes the suburbanisation around the globe, in Poland, and around Warsaw. The objective of the study is the analysis of possible uses of information on transactions regarding undeveloped land properties allocated for building development for the identification of areas of future intensification of the suburbanisation. For verification of the correlation of property turnover with later suburbanisation, research was conducted on the general and detailed level. On the general level, the research involved the verification of the correlation between the total number of transactions in particular cadastral units in the years 2009–2014 and a change in the area of arable land around Warsaw. On the detailed level, two selected communes were analysed in terms of percentage and time period during which land properties subject to transactions were designated for building development investments. 40% of the analysed developed properties were determined to be subject to a transaction as undeveloped properties up to three years before. Approximately 30% of the analysed land properties subject to transactions were also subject to building development within three years from the date of transaction. Therefore, information on turnover of land properties permits predicting the suburbanisation.

KEY WORDS

land, building land, suburbanisation, undeveloped land properties, real property turnover

1 INTRODUCTION

Sustainable development of suburban areas is a term referring to a number of issues, including rational management of space – a presumably renewable resource. The negative phenomenon of uncontrolled suburbanisation occurs around larger urban centres. It poses a threat to the sustainable development of suburban areas. Convenient location, close vicinity to the urban centre, and good transport accessibility are the primary factors determining allocation for building development of frequently the highest quality arable land of high agricultural usability, legally protected, and parcels with a shape making their optimum management difficult (Salamon, 2010; Bitner, 2011; Bielska, Budzyński and Krupowicz 2015; Przegon, Bacior and Sobolewska-Mikulska, 2016). In sustainable development, social, economic, and environmental elements should be harmonised. A disturbance of one of the systems results in loss of balance of the remaining ones (Bielnińska et al., 2014). Suburbanization is a threat to sustainable development and consequently it may reduce the territorial attractiveness described by Živković et al. (2015). Therefore, rational space management in suburban areas gains particular importance in reference to the essence of the doctrine.

Urbanisation in suburban zones, known as suburbanisation, are currently one of the primary problems in the development of large European cities and their peripheral zones, both in so-called “old Europe” (Penerai, 2008 Phelps and Wu, 2011; Phelps 2017) and in the majority of large cities in post-Communist countries (Sýkora, 1999; Tammaru, Kulu and Kask, 2004; Hirt, 2007; Sýkora and Ouředníček, 2007; Kährík and Tammaru, 2008; Pojani, 2011; Krišjāne and Bērziņš, 2012; Kubeš, 2013; Stanilov and Sýkora, 2014; Tanaš and Trojanek, 2014; Mihai, Nistor and Simion, 2015). Such processes cover further spatial development of cities, transformations of urban structures spatially arranged in loose groups of settlement units, spatial-functional integration leading to combining of neighbouring agglomerations, as well as urbanisation of typically rural areas leading to the disappearance of the dichotomy between urban and rural areas (Bański, 2008). The next stage of the suburbanisation is the most harmful in terms of rational space management. It involves desurbanisation, i.e. the process of dilution of urban structures. As a result of desurbanisation, internal areas of cities gain a structure resembling that of the suburbs through random parcellation of space, and reduction in population density. Suburban areas develop amorphous systems of building development, difficult to efficiently support by technical and service infrastructure (Chmielewski, 2005; Lorens, 2005). Such processes lead to the development of a new “dispersed city”, with “declining image of the traditional city, still regarded as a kind of an identification mark, spatial expression of urban identity” (Gzell, 2015, p. 22).

The first urban planning concepts striving for loosening urban building development and creating healthy residential conditions with green areas, as well as offering necessary services and workplaces, included among others the concept of garden cities by Howard, linear cities, idea of neighbourhood units by Perry, and the radiant city by Le Corbusier (Ostrowski, 1975). The ideas quickly gained interest of American urban planners. At the beginning, the process showed features of suburbanisation, but with time it developed into a phenomenon of a regional and supraregional scale. According to Jane Jacobs (1992, p. 25), designs of reorganisation of residential districts and construction of new ones at motorways far outside city boundaries “changed the urban and rural landscape into indigestible slurry”. In the 1970’s, for the first time since the population census in 1790, the number of residents of non-metropolitan

areas in the USA, i.e. rural areas and towns, grew faster than the number of population of metropolitan areas. As a result of rapid development of suburbs, cities began to lose their central role, and the share of people inhabiting central districts declined to 40.1% (Grzeszczak, 1996). Therefore, the United States have become a suburban society: more people lives around central districts of large cities than in the cities themselves (Węglański, 1988). In the second half of the 1980's, counterurbanisation processes in the USA declined, and the number of population of metropolitan areas began growing again, particularly in larger metropolises (op. cit. Grzeszczak, 1996). As mentioned earlier, the expansion of cities was also observed in European countries (Sýkora, 1999; Tammaru, Kulu and Kask, 2004; Sýkora and Ouředníček, 2007; Kährlik and Tammaru, 2008; Penerai, 2008; Pojani, 2011; Krišjāne and Bērziņš, 2012; Stanilov and Sýkora, 2014; Tanaš and Trojanek, 2014; Mihai, Nistor and Simion, 2015). It was considered socially harmful already at the beginning of the 20th century. In spite of similar background, suburbanisation in the United States and Europe were quite different. One of the primary factors differentiating European cities from American cities involved historically developed downtowns with high concentration of services, but with residential buildings with low standard. Suburbs surrounding the cities also included residential districts, however not at the scale encountered in the USA. Their demographic and social structure was also different (they were distinguished by lower population density, lower dependence on the car, and were much less extensive than the American counterparts) (Couch Couch, Leontidou and Petschel-Held, 2007, p. 16). In contrast to the urban development of urban centres (defined as the expansion of the population and increased urban planning activity) – urban growth, the urbanisation in suburbs – urban sprawl is best characterised by the coefficient of intensity of building development and density of population depending on the city centre. In urban sprawl processes, the intensity maintains considerable values at a large distance from the centre with a simultaneous decrease in population density in the city centre in comparison to urban centres before the transformation. According to Couch, Leontidou and Petschel-Held (2007), countries that prefer private property of apartments, and those in the period of transformations (Hungary, Czech Republic, Poland, Slovenia, and Croatia) turned out to be the most prone to suburbanisation processes. Such processes were activated particularly intensively also in the Mediterranean countries (particularly in Greece).

As a remedy for the process of urban sprawl, countries of the European Union undertook a number of economic-spatial activities. In many European cities, intensive revaluation processes of downtowns and spatially degraded areas commenced. This resulted in the return of wealthy residents to city centres, and activation of the central city. Another way to discipline dispersed building development in suburban zones was the construction of new satellite cities – districts or complexes of building development of various sizes equipped with basic elements of technical and social infrastructure (Mourard and Fourquet 2004). In modern times, however, in the era of energetic crisis and rules of sustainable urban planning, optimum indices of parameters of building development intensity for the compact pro-ecological city are sought for that would provide good living conditions with high concentration of building development, so that the city „does not devour valuable space” (Belliot, 2006, p. 15; Charlot-Valdieu and Outrequin, 2009, p. 102).

In the “old members” of the European Union, high importance is also ascribed to rationalisation of development of cities and land management. Control and monitoring of spatial processes is also conducted. In public systems of planning of spatial development, the steering role is played by governments.

Implementation tasks are entrusted with territorial, communal, and district self-governments. The foundation of statutory regulations is the rule of respect for common good, resulting in the implementation of separate laws for building development and land property. This means that as long as given land is not allocated by the commune for urbanisation or investment, as expressed in the preparation of a local plan and implementing infrastructure on given land, the owner is not entitled to change the form of land use or divide the property. Acting based on the law approving the development plans, the commune does not bear any legal-financial consequences in the case of refusal of change of land use in a property. Unlike in Poland, the issuance of a building permit can only occur for land for which a binding plan exists, land consolidation and parcellation was performed in accordance with the guidelines of the plan, and necessary infrastructure was introduced. Research is also conducted on consequences of changes in the state of land management, and social and economic effects of the conducted spatial policy. In many European countries, restrictive planning activities effectively hindered the dispersal of building development. A decrease in the growth of population or growth below the national average was recorded in peripheral areas, and an increase in central zones. This suggests that the general intensification of the counterurbanisation tendencies did not occur, and in the majority of countries the rate of de-concentration was reduced, or the tendency was reversed (op. cit. Grzeszczak, 1996).

Suburbanisation and desurbanisation, as processes dominating modern problems of urban and suburban development, are complex phenomena. They can be discussed in many aspects, among others in environmental, economic, and social (Echenique et al., 2012). In the environmental aspect, spreading of cities onto rural areas causes a number of unfavourable phenomena in relations between open and urbanised areas, such as among others devastation of the cultural landscape of rural areas, loss of spatial order, planning residential development on land originally not predestined for such a purpose (Bontje, 2001; Zuziak, 2005; Degórska, 2007), defragmentation of local environmental relations, reduces biodiversity, increases greenhouse gas emission, and moving green areas (for potential recreation) further from residential areas in city centres (Rogers and Power, 2000).

In the economic aspect, consequences of the urbanisation of suburban areas include residential-investment building development not related to agricultural economy around cities. This results in an increase in the value of properties (Figure 1).

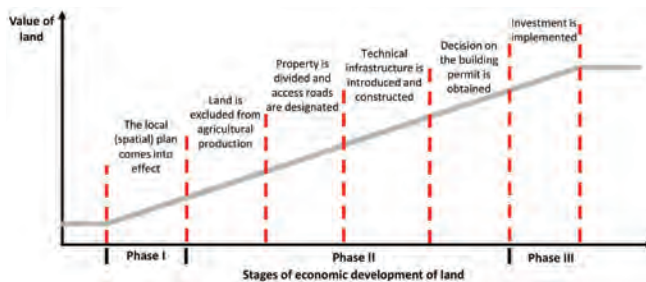


Figure 1: Stages of the investment process and its effect on the value of land.

Investments process causes an increase in demand for land, and income to commune budgets in the form of property tax (increase in investment of communal areas) and personal income tax (Smutek, 2012a), but also expenditures related among others to investment in technical infrastructure, particularly

transport and water-sewage systems (Smutek, 2012b). Excessive change in allocation of arable land, and replacing agricultural functions with other, more profitable ones (op. cit. Bański, 2008) also results in leaving considerable amounts of land fallow while awaiting their sale. This confirms a decline in interest in land cultivation (Degórska and Dereęowska, 2008). In the suburban zone, as a result of urbanisation, not only land use transformations occur, but also social-demographic changes. The processes result in the development of non-agricultural forms of land management, and inflow of new residents from the city. The mono-functionality development of suburbia, with only residential function, causes the phenomenon of “bedroom community” (Dinić and Mitković, 2016). New residents with specific preferences and expectations begin to transform the surrounding space in a manner frequently threatening the natural environment, making it more similar to the urban landscape (of residential areas). With migrations of urban population to rural areas, residents of the latter also adopt the city lifestyle, absorbing not always the best patterns from urban architecture and customs, and abandoning their regional roots. In spite of the improvement of life in such rural areas, the negative effects include a decline in interpersonal relations, conflicts between local and inflowing communities, and social segregation of residents (Topa and Zenou, 2015). New residents also show deterioration in the state of health resulting from every-day time-consuming commuting and travels to city centres for satisfying basic needs (Schweitzer and Zhou, 2010). Cost of the provision of utilities such as water supply, sewage system, and other services also increase (Chmielewski, 2002; Śleszyński, 2018).

One of the strategic objectives stipulated in the National Urban Policy 2023 (2015) adopted by the Council of Ministers on 20 October 2015 is counteracting negative phenomena of uncontrolled suburbanisation through striving for a reduction in the chaotic growth of dispersed building development, and greater care for the protection of the natural environment, land resources, and landscape quality. It is believed that data from the real estate market should be an important source of information in the scope, and particularly analyses based on the market of non-developed land properties which are or can be allocated for building development (Pęchorzewski, 2008; Radziszewska, Jaroszewicz and Szafranek, 2012; Gnat and Bas, 2013; Jaroszewicz, Krupowicz and Sajnog, 2014). Such properties reflect the complex environmental, economic, and social situation occurring in a given area. Furthermore the authors of this paper believe that in zones with more transactions, demand for land properties is increased, and more dynamic changes in land management will occur in the future (parcels will be subject to building development). The situation is the opposite where building development processes are already intensified. Such areas will also experience more activity on the property market. The presumption of the connection between property turnover and the future building development results from the fact that the majority of persons constructing residential buildings for own purposes or developers do it on parcels purchased earlier for this purpose. Apart from the general trend of increase in prices in the property market, an increase in average prices of undeveloped land properties can also mean building development in a given area. Unitary prices of land for building development are higher in areas already at least partially subject to such development than in undeveloped areas. Those analyses of buyer’s preferences are important for urban planners for the most cost-effective use of space (Nahtigal and Grum, 2015).

The objective of the study is the analysis of possible uses of information concerning transactions regarding undeveloped land properties allocated for building development (particularly the number of transactions concerning such properties, their spatial distribution, unitary prices, average prices of properties,

and their changes in a given area) for the identification of areas of future intensification of processes of building development in properties located in the suburban zone. We assume and verify the correlation of property turnover with later suburbanisation. Forecasting the occurrence of uncontrolled suburbanisation in particular locations can be helpful in planning activities reducing its negative effect with consideration of the principles of sustainable development of suburban areas.

2 SUBURBANISATION AROUND THE CAPITAL CITY OF POLAND

Spatial conflicts in European cities are particularly intensified in Polish cities which after the period of socialist economy entered the age of transformations completely unprepared for the new reality (Paszowski, 2011). With the introduction of market mechanisms, they did not become classic “capitalist” cities, but rather hybrids of both systems – “post-socialist cities” (Lorens, 2008, p. 31). Suburbanisation also took a specific form due to the conditions of development of settlement forms untypical in comparison to the neighbouring countries.

In the region of Warsaw (the capital city), spatial development in rural areas was determined by numerous political transformations, including three agricultural reforms, performed in 1864, 1920, 1944. They led to the liquidation of larger land properties and contributed to the fragmentation of farms and development of new agricultural settlements, frequently separated from complexes of rural development. After the 2nd World War, due to material losses in special structure and as a result of the destruction of bourgeois culture, cities lost their historical continuity. In the period of the People’s Republic of Poland (in years 1970’s and 1980’s), development of cities was particularly associated in the awareness of politicians with areal expansion: the size of cities was increased through incorporating the surrounding successively developed villages.

Urban space was not of economic character, and its development was subjected to political power. Development plans of the Warsaw Voivodship (passed in 1978) still did not identify the threat of expansion of building development outside urbanised areas, although the trend of single-family residential building development indicated a serious threat. Relatively easily accessible and therefore undeveloped areas, not planned for urbanisation in the plan, were allocated for complexes of detached houses (Majewska, 2012). Spatial development plans for communes in the vicinity of Warsaw stipulated building areas, also between places designates in the Voivodship plan by belts of spatial development. As a result of the transformations, the belt-node spatial structure of the agglomeration successively lost transparency, creating a chaotic cluster of dispersed building development, not only extending the settlement belts, but also encroaching on areas between them (Chmielewski, 2002, Śleszyński, 2012).

The crisis in many areas of the economy in the 1980’s particularly strongly affected residential development. A drastic decline in construction of residential buildings occurred in comparison to the growing needs. The availability of land and possibility of construction on arable land – so-called “settlements” contributed to a rapid increase in construction of single-family houses – usually for people not related to work in a rural homestead. The only criterion for selection of location was accessibility of the public road. The process of building development around roads commenced, involving quarters of buildings left with no road access.

After the political transformation in the 1990’s, the purpose of considerable amounts of arable land was changed in development plans passed in the period (particularly to housing development), exceeding

the actual needs and possibilities of building development in the areas (among others: Markowski, 2004; Strzelecki and Kucińska 2006; Degórska and Deręgowska, 2008; Śleszyński, 2012). The processes were also favoured by the extremely liberal approach to the ownership right – in contrast to the limited approach to ownership in the socialist period.

The created legal possibilities and the resulting functional-economic structures launched a process of dispersion of building development in Poland, particularly in regions where agriculture ceased to be the primary source of income. Such regions are areas around large cities where residents commute. In spite of attempts to manage planning processes through planning acts from 1994 and 2003, no legal measures currently exist in Poland permitting steering of the uncontrolled allocation of arable land for building development. The binding land use indices permitted urbanisation of increasingly more new areas excluded from agricultural production. Building development often occurs on plots with a layout characteristic of rural areas (narrow elongated plots) without conducting processes of plot structure transformation, which results in among others irrational parameters of roads and parcels (an example is presented in Figure 3).

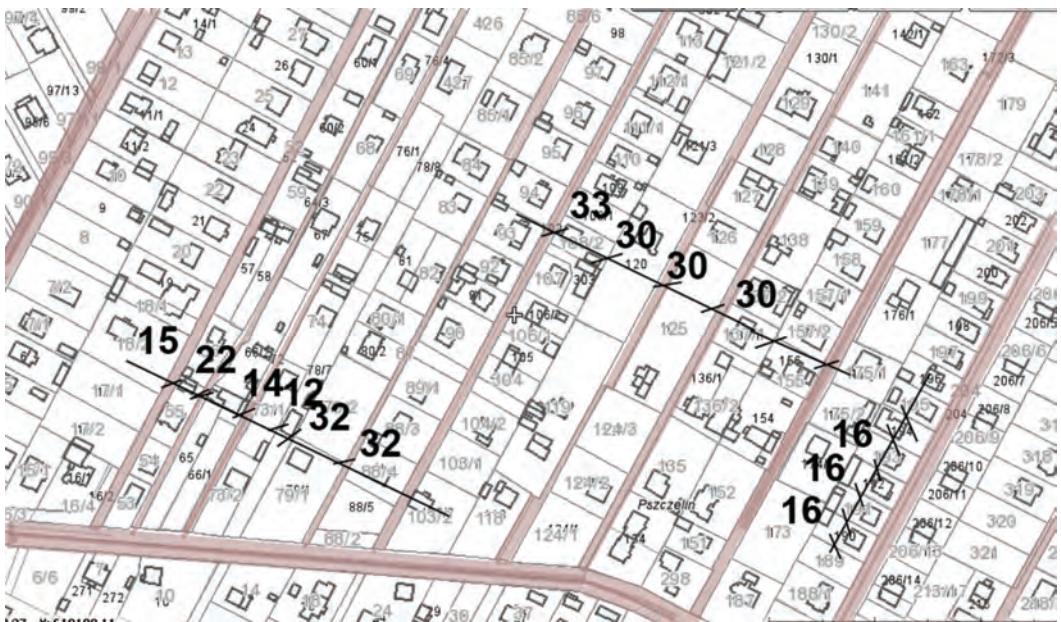


Figure 2: Brwinów city in the vicinity of Warsaw, new urbanisation areas in the territory of the former Pszczelin village.

New defective forms of spatial development of rural areas, and the accompanying emission of pollutants (to water, soil, and air) result in a decline of the quality of life of residents of the agglomeration. Service complexes with the commercial, logistics, and even entertainment functions were removed from the central zones. The phenomenon generates traffic of private cars on all transport routes between the city and rural areas (particularly exit from the city). This is a considerable inconvenience for users of the urban space. Defragmentation of local ecosystems and disturbance of environmental relations occur – conflicting with the rules of sustainable development. They also disturb spatial order in the suburban zone of the capital (op. cit. Chmielewski, 2005) and cause an increase in the costs of provision of infrastructure facilities (Chmielewski, 2002; Śleszyński, 2018).

4 METHODS

This paper presents a method of identification of future suburbanisation areas. It is based on the analysis of transactions regarding undeveloped land properties allocated for building development other than homestead development (so-called “*zabudowa siedliskowa*” an official category denoting construction either residential or non-residential, but intimately associated with the activity of farming – def. follow: Degórska, 2012 p. 91) at the studied locations. The method is based on the assumption that a major part of purchasers of undeveloped land properties will eventually commence the investment processes. For the purpose of verification of the assumed correlation of property turnover with later suburbanisation constituting the core of the proposed method, research was conducted on the general and detailed level.

The research was preceded by the analysis of relative changes of arable land area in cadastral units (urban and rural communes and urban and rural areas of urban-rural communes) in the period from 1. 1. 2009 to 1. 1. 2015 in districts directly neighbouring with the capital city of Warsaw, and nowodworski district located in close vicinity to the capital city – Figure 3. In the majority of cadastral units, the areas of the land decreased, although the intensity of the process is varied. For the detailed level of research we selected Jabłonna and Celestynów municipalities, also shown in Figure 3.

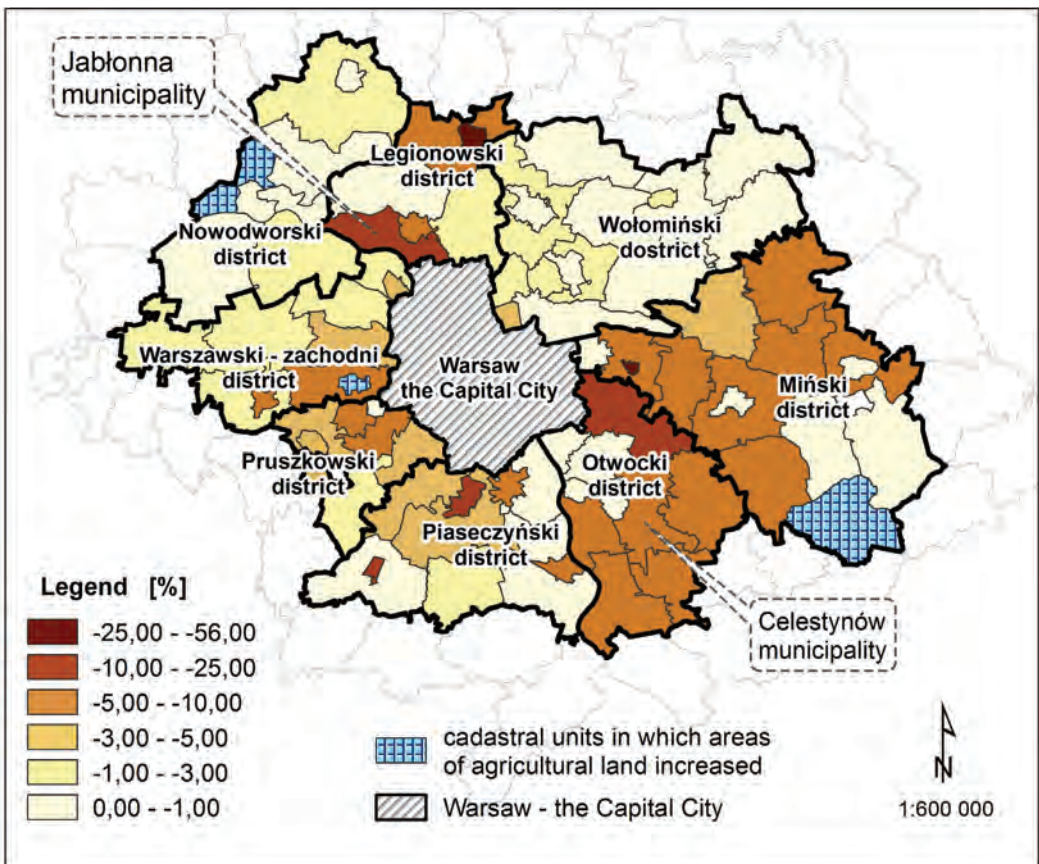


Figure 3: Changes (%) of the area of arable land in the surroundings of Warsaw in the period from 1. 1. 2009 to 1. 1. 2015.

On the general level, the research involved the verification of the correlation between the total number of transactions concerning undeveloped land properties allocated for building development other than homestead development in the analysed cadastral units in the years 2009–2014 and change in the area of arable land (the absolute change in ha) in such units in the same period. The data were obtained from registers of prices and values of properties and collections of data covered by the land and building registers (both are run by the *starost* – district office)

Pearson's coefficients of linear correlation were calculated for all cadastral units in all analyzed districts (value of coefficient r in result Table 1). Additionally, after excluding the most extreme outlier (that is cadastral unit lowering the absolute value of coefficient r to the highest degree), Pearson's coefficients of linear correlation were calculated again (value of coefficient r^* in result Table 1).

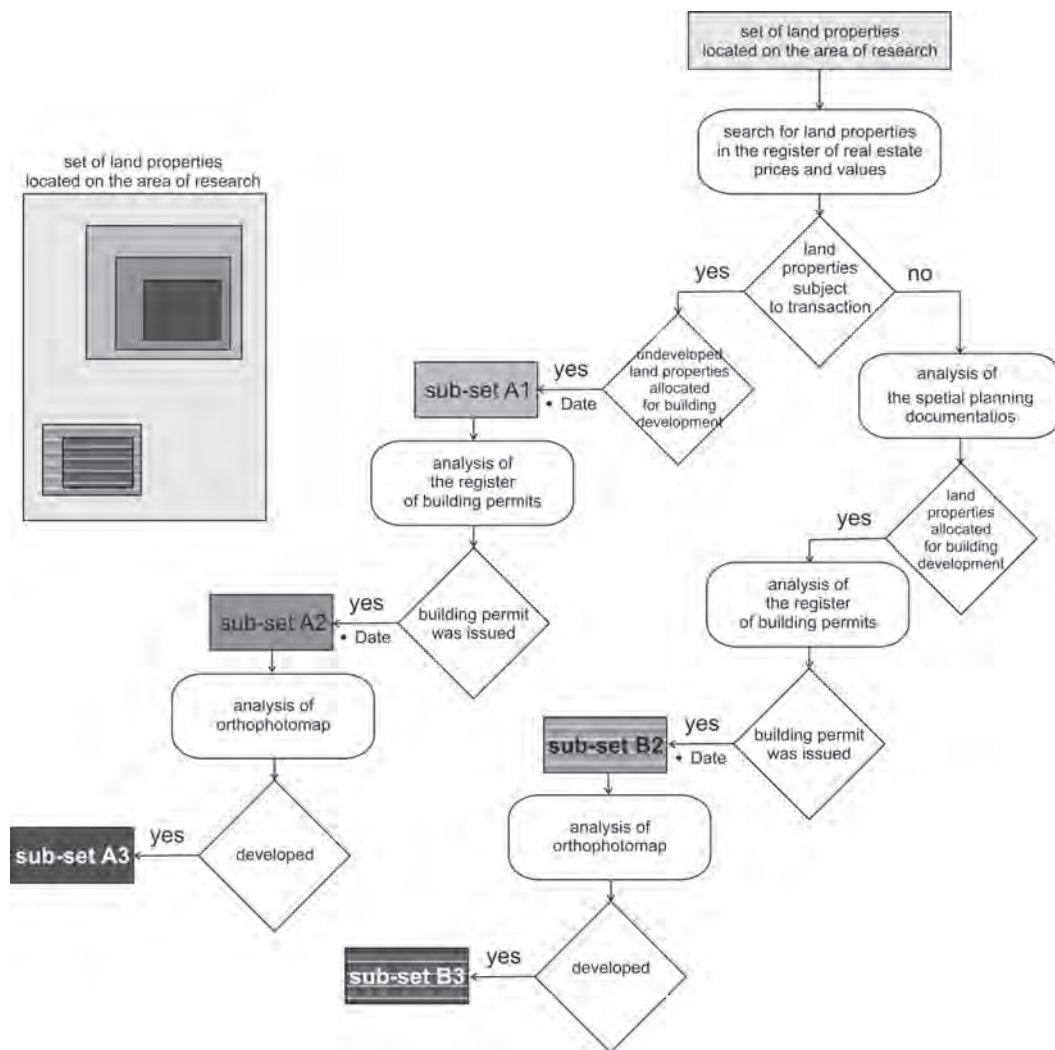


Figure 4: Diagram presenting the general idea of the detailed research.

On the detailed level, we conduct research in two selected rural communities. We adopted the obvious assumption that only a part of plots potentially designated for building development become subject to transactions. Furthermore, no building investments commence on part of them for many years. As a consequence, a building permit is obtained and implementation of an investment commences only in reference to some of them. The aforementioned phenomenon is presented in Figure 4. The analysis of the degree and time period in which building investments are implemented on plots subject to transactions permits the development of a prediction model of processes of actual urbanisation in the analysed suburban area. The conducted detailed analyses the general idea of which was presented in the figure (Fig. 4) permit the determination of the following:

- what percent of plots subject to sale in the analysed period is developed later, and in what period of time
- what percent of plots for which a building permit was issued in the analysed period was subject to transactions in the previous years (the study adopted a period of up to five years preceding the date of issuance of the building permit), and what percent of such plots was actually developed.

5 RESULTS

The results of verification of the method based on the general level analysis for 5 districts adjacent to the capital city of Warsaw are included in Table 1.

Table 1: Linear correlation coefficients for the number of transactions and change of the area of arable land based on all cadastral units – r , and without consideration of the cadastral unit lowering the value of the correlation coefficient to the highest degree – r^* .

District	Value of coefficient r / r^*	Name of cadastral unit not considered in the calculation of r^*
Legionowo	–0.39 / –0.94	Wieliszew
Mińsk	–0.19 / –0.30	Siennica
Otwock	–0.39 / –0.53	Józefów
Pruszków	–0.68 / –0.98	Nadarzyn
Warszawa-west	–0.65 / –0.83	Kampinos

The linear correlation coefficients allow the determination of the existence of correlation between the number of transactions concerning undeveloped land property allocated for building development other than homestead development, and a change in the area of arable land. Negative values of the aforementioned coefficients suggest that a higher number of transactions determined higher losses of area of arable land. The correlation is strong in the case of districts: Legionowo, Pruszków, and Warszawa-west. The correlation coefficient without consideration of the cadastral unit lowering the value of the coefficient to the highest degree varied from –0.83 to –0.94. Only for the Otwock district, the correlation showed mean strength r^* of –0.53, and for the Mińsk district it was weak – r^* reached a value of –0.30.

The verification of the method was conducted on the analysis on lower spatial level based on the example of two selected rural communes:

1. Jabłonna, distinguished by very high loss of arable land and very high increase in the area of building developed, including residential areas, as well as a very high number of transactions concerning properties allocated for building development;

2. Celestynów, distinguished by average loss of the area of arable land and increase in the area of developed and urbanised land, including residential areas, as well as an average number of transactions concerning properties allocated for building development.

We conducted slightly different research in two selected rural communities:

For the Jabłonna commune, the analysis of the register of building permits from the years 2011–2012 was performed. For 147 properties for which a decision of permission for construction of usually a residential building was issued, their construction was verified based on the cadastral map and orthophoto. 111 of them were constructed (i.e. 75%). It was also verified which of the properties had been subject to a transaction. It was determined that 43, i.e. 39% of developed properties had been subject to a transaction earlier, in the years 2009–2012 (Figure 5).

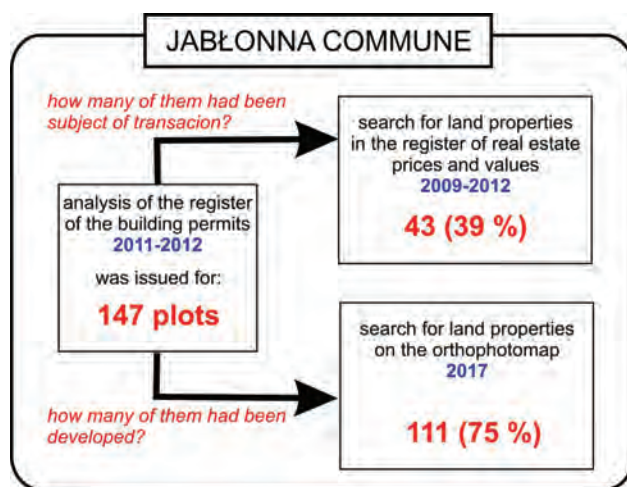


Figure 5: Results of detailed analyses for the Jabłonna commune.

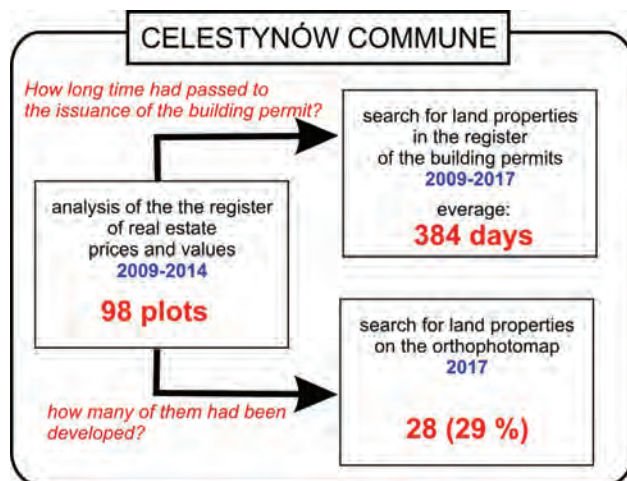


Figure 6: Results of detailed analyses for the Celestynów commune.

For the Celestynów commune, after the analysis of transactions concerning undeveloped land properties allocated for building development other than homestead development, the analysis of the register of building permits from the years 2009–2014 was performed. It was verified whether for a property subject to a transaction in the years 2009–2014 a building permit was then issued, and how long time had passed from the notarial deed of the sale of the property to the issuance of the building permit. The average time amounted to 384 days, i.e. slightly more than a year.

It was also determined that among 98 properties allocated for building development subject to transactions, 28, i.e. 29% of parcels were developed (Figure 6).

6 DISCUSSION AND CONCLUSIONS

In the case of the majority of districts, the results showed a strong correlation between the loss of arable land and number of transactions concerning undeveloped land allocated for building development other than homestead development. This confirms the thesis that information on the number of transactions concerning undeveloped land allocated for building development other than homestead development is a good measure permitting predicting the intensity of processes related to new building development in suburban areas, and the related changes in land use.

It was also determined that a considerable part – 39% of the analysed developed properties had been subject to a transaction as undeveloped properties up to three years before. A part of undeveloped land properties allocated for building development other than homestead development, subject to transactions – 29% of the analysed cases, is subject to building development within three years from the date of transaction. This allows us to predict the intensity of building development. Summing up the discussed issue, notice a similar effect of restrictions on turnover of arable land on the intensity of the suburbanisation. Such restrictions were introduced based on the act of 14 April 2016 on withholding of the sale of properties of the Agriculture Property Stock of the State Treasury and on the amendment to certain acts which came into force on 30 April 2016 (ACT, 2016). Considering a decrease in the number of transactions concerning undeveloped land properties constituting arable land, slowing down of the suburbanisation in the suburban zone dominated by arable land can be expected in several years. Before this happens, however, the process will intensify, considering ongoing building development on properties purchased before 30 April 2016.

Literature and references:

- ACT (2016). Ustawa z dnia 14 kwietnia 2016 r. o wstrzymaniu sprzedaży nieruchomości Zasobu Własności Rolnej Skarbu Państwa oraz zmianie niektórych ustaw (Dz. U. z 2016 r., poz. 585.) (= Act of 14 April 2016 on withholding of the sale of properties of the Agricultural Properties Resource of the State Treasury and on the amendment of certain acts, *Journal of Laws of 2016*, item 585). (in Polish)
- Bański, J. (2008). Strefa podmiejska – już nie miasto, jeszcze nie wieś (= Suburban zone – between urban and rural). In A. Jezierska-Hole (Ed.), L. Kozłowski (Ed.), *Gospodarka przestrzenna w strefie kontinuum miejsko-wiejskiego w Polsce* (= Spatial management in the zone of urban-rural continuum in Poland) (pp. 29–44). Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika. (in Polish)
- Belliot, M. (Ed.) (2006). *Habitat formes urbaines. Densités comparées et tendances d'évolution en France* (= Habitat: urban forms. Comparative densities and trends in France). Paris: Fédération Nationale des Agences d'Urbanisme, 272 p. (in French)
- Bielińska, E., Baran, S., Pawłowski, L., Józwiakowski, K., Futa, B., Bik-Malodzińska, M., Mucha, Z., Generowicz, A. (2014). Theoretical aspects of the integrated protection of suburban areas. *Problemy ekorozwoju – Problems of sustainable development*, 9 (1), 127–139. <http://ekorozwoj.pol.lublin.pl/no17/r.pdf>.
- Bielska, A., Budzyński, T., Krupowicz, W. (2015). The effects of defective spatial structure on the agricultural property market. *Folia Oeconomica Stetinensia*, 15 (1), 174–192. DOI: <https://doi.org/10.1515/foli-2015-0028>

- Bitner, A. (2011). Charakterystycy kształt działek ewidencyjnych na terenach zurbanizowanych – analiza struktury morfologicznej miast (= Characteristic shape of land parcels on the urbanized areas - the analysis of morphological structure of a city). *Acta Scientiarum Polonorum. Geodesia et Descriptio Terrarum*, 10 (1), 23–31. (in Polish)
- Bontje, M. A. (2001). The Challenge of Planned Urbanisation. Urbanisation and National Urbanisation Policy in the Netherlands in a Northwest-European Perspective. Amsterdam: AME, 309 p.
- Charlot-Valdieu, C., Outrequin, P. (2009). L'urbanisme durable. Concevoir un écoquartier (= Sustainable urban planning. Designing an eco-neighborhood). Paris: Le Moniteur Editions, 295 p. (in French)
- Chmielewski, J. M. (2002). Koncepcja rozwoju aglomeracji warszawskiej a jej stan obecny - osiągnięcia i perspektywy Warszawskiego Śródmieścia Urbanistów i Planistów Przestrzennych u progu 80 – lecia TUP. Warszawa, p. 58–66.
- Chmielewski, J. M. (2005). Problemy rozpraszania się zabudowy na obszarze metropolitalnym Warszawy (= Problems of building development dispersion in the metropolitan area of Warsaw). In P. Lorens (Ed.), *Problem suburbanizacji (= Problem of Suburbanisation)* (pp. 52–62). Biblioteka Urbanisty, Warszawa. (in Polish)
- Couch, Ch., Leontidou, L., Petschel-Held, G. (2007). Urban Sprawl in Europe: Landscapes, Land-Use Change & Policy. Blackwell Publishing, 296 p. DOI: <https://doi.org/10.1002/9780470692066>
- Degórska, B. (2007). Wybrane problemy zagospodarowania i ochrony środowiska związane z rozwojem suburbanizacji (= Selected problems of environmental management and protection related to the suburbanisation development). *Biuletyn KPZK PAN*, 230, 75–88. (in Polish)
- Degórska, B., Deregowska, A. (2008). Zmiany krajobrazu Obszaru Metropolitalnego Warszawy na przełomie XX i XXI wieku. Atlas Warszawy (= Changes in the metropolitan landscape of Warsaw at the turn of the 20th and 21st century. Atlas of Warsaw). Warszawa: Instytut Geografii i Przestrzennego Zagospodarowania PAN, 150 p. (in Polish)
- Dinić, M., Mitković, P. (2016). Suburban design: from “bedroom communities” to sustainable neighborhoods. *Geodetski vestnik*, 60 (1), 98–113. DOI: <https://doi.org/10.15292/geodetski-vestnik.2016.01.98-113>
- Echenique, M. H., Hargreaves, A. J., Mitchell, G., Namdeo, A. (2012). Growing Cities Sustainably. *Journal of the American Planning Association*, 78 (2), 121–137. DOI: <https://doi.org/10.1080/01944363.2012.666731>
- Gnat, S., Bas, M., (2013). Statistical analysis of chosen aspects of suburbanisation process in Szczecin in 2006–2011. *Real Estate Management and Valuation*, 21 (3), 71–80. DOI: <https://doi.org/10.2478/remav-2013-0028>
- Grzeszczak, J. (1996). Tendencje kontrurbanizacyjne w krajach Europy Zachodniej (= Counterurbanization tendencies in Western European countries). Wrocław: Instytut Geografii i Przestrzennego Zagospodarowania PAN, 82 p. (in Polish)
- Gzell, S. (2015). Wykłady o współczesnej urbanistyce with English supplement on contemporary town planning (= Lectures on modern urban planning with English supplement on contemporary town planning). Warszawa: Oficyna Wydawnicza Politechniki Warszawskiej, 208 p. (in Polish)
- Hirt, S. (2007). Suburbanizing Sofia: Characteristics of post-socialist peri-urban change. *Urban Geography*, 28 (8), 755–780. DOI: <https://doi.org/10.2747/0272-3638.28.8.755>
- Jacobs, J. (2002). *The Death and Life of Great American Cities*. Vintage Books, 480 p. (First published 1961).
- Jaroszewicz, J., Krupowicz, W., Sajnog, N. (2014). Monitoring of transaction prices of land involving spatial statistical analyses for the purposes of spatial management. In S. Żróbek (Ed.), *Analiza rynku i zarządzanie nieruchomościami (= Market analysis and property management)* (pp.23–39). Olsztyn: Towarzystwo Naukowe Nieruchomości.
- Kährnik, A., Tammaru, T. (2008). Population composition in new suburban settlements of the Tallinn metropolitan area. *Urban Studies*, 45 (5–6), 1055–1078. DOI: <https://doi.org/10.1177/0042098008089853>
- Krišjāne, Z., Bērziņš, M. (2012). Post-socialist urban trends: New patterns and motivations for migration in the suburban areas of Riga, Latvia. *Urban Studies*, 49 (2), 289–306. DOI: <https://doi.org/10.1177/0042098011402232>
- Kubeš, J. (2013). European post-socialist cities and their near hinterland in intra-urban geography literature. *Bulletin of Geography. Socio-economic Series* 2013, 19, 19–43. DOI: <https://doi.org/10.2478/bog-2013-0002>
- Lorens, P. (2005). Dlaczego problem suburbanizacji? Wprowadzenie (= Why problem of suburbanisation? Introduction). In P. Lorens (Ed.), *Problem suburbanizacji (= Problem of Suburbanisation)* (pp. 6–8). Biblioteka Urbanisty 7, Warszawa. (in Polish)
- Lorens, P. (2008). Główne tendencje przemiany struktury funkcjonalno – przestrzennej współczesnych miast, (= Primary tendencies of transformations of the functional-spatial structure of modern cities). In P. Lorens (Ed.), E. Ratajczyk-Piątkowska (Ed.), *Komercjalizacja przestrzeni – charakterystyczne zjawiska (= Commercialisation of space – characteristic phenomena)*. Biblioteka Urbanisty 12, Warszawa. (in Polish)
- Majewska, A. (2012). Suburbanizacja w strefie metropolitarnej Warszawy, jako zagrożenie zrównoważonego rozwoju (= Suburbanisation in the Warsaw Metropolitan Area as a threat to sustainable development). In A. Maciejewska (Ed.), *Gospodarka przestrzenne w świetle wymagań strategii zrównoważonego rozwoju (= Spatial management in the context of requirements of the sustainable development strategy)* (pp. 308–320). *Studia vol. 42*, Komitet Przestrzennego Zagospodarowania Kraju PAN, Warszawa. (in Polish)
- Markowski, T. (2004). Miasta polskie w procesie transformacji (= Polish cities in the process of transformations). In M. Koczanowski (Ed.), P. Lorens (Ed.), *Miasto wspólne dobro i zbiorowy obowiązek (= City – common good and collective obligation)*. Biblioteka Urbanisty 2, Warszawa (in Polish)
- Mihai, B., Nistor, C., Simion, G. (2015). Post-Socialist Urban Growth of Bucharest, Romania-A Change Detection Analysis On Landsat Imagery (1984–2010). *Acta geographica Slovenica*, 55 (2), 223–234 DOI: <https://doi.org/10.3986/AGS.709>
- Nahtigal, D., Grum, B. (2015). Segmentation and the value frame of buyers of residential apartments. *Geodetski vestnik*, 59 (1), 71–101. DOI: <http://dx.doi.org/10.15292/geodetski-vestnik.2015.01.071-101>
- National Urban Policy 2023 (2015). *Krajowa Polityka Miejska 2023*. Ministerstwo Rozwoju Regionalnego, Warszawa. (in Polish). https://www.mr.gov.pl/media/10252/Krajowa_Polityka_Miejska_20-10-2015.pdf

- Ostrowski, W. (1975). *Urbanistyka współczesna (= Modern urban planning)*. Warszawa: Wydawnictwo Arkady. (in Polish)
- Paszowski, Z. (2011). *Miasto idealne w perspektywie europejskiej i jego związki z urbanistyką współczesną (= Ideal city in the European perspective and its relations to modern urban planning)*. Kraków: Wydawnictwo Universitas, 324 p. (in Polish)
- Penerai, P. (2008). *Paris métropole. Forme et échelles du Grande-Paris*. Paris: Éditions de la Villette. (in French)
- Pęchorzewski, D. (2008). Comparative analysis of suburbanization in selected cities of Central and Eastern Europe in the years 1990-2007. In D. Popescu et. al. (ed.), *Environmental Problems And Development* (pp. 66–70). Bucharest, Romania.
- Phelps, N.A., Wu, F. (2011). *International perspectives on suburbanization: a post-suburban world?* Palgrave Macmillan UK, 289 p.
- Phelps, N.A. (2017). *Old Europe, new suburbanization?: governance, land, and infrastructure in European suburbanization*. University of Toronto Press, Scholarly Publishing Division, 280 p. DOI: <https://doi.org/10.3138/9781442616479>
- Pojani, D. (2011). Urban and suburban retail development in Albania's capital after socialism. *Land Use Policy*, 28 (4), 836-845. DOI: <https://doi.org/10.1016/j.landusepol.2011.02.001>
- Przegon, W., Baciór, S., Sobolewska-Mikulska, K. (2016). Cartographic analysis of transformations of the spatial structure of lands of Podgórze in Krakow in Poland in the period of 1847–2016. *Geodetski vestnik*, 61 (2), 278–292. DOI: <https://doi.org/10.15292/geodetski-vestnik.2017.02.278-292>
- Radziszewska, W., Jaroszewicz, J., Szafranek, A. (2012). Rozkład przestrzenny wartości rynkowych gruntów przeznaczonych pod zabudowę mieszkaniową na obszarach wiejskich w sferze oddziaływania miasta (= Spatial distribution of market values of land for residential housing in rural areas in the zone of influence of urban areas). *Studia Obszarów Wiejskich*, 29, 105–128.
- Rogers, R., Power, A. (2000). *Cities for a Small Country*. London: Faber and Faber, 320 p.
- Salamon, J. (2010). Analiza czynników wpływających na ceny działek rolnych i budowlanych na przykładzie gminy Bochnia (= Analysis of factors affecting prices of agricultural and building plots on an example of Bochnia commune). *Infrastruktura i Ekologia Terenów Wiejskich*, 2, 185–191. (in Polish)
- Schweitzer, L., Zhou, J. (2010). Neighbourhood air quality, respiratory health, and vulnerable populations in compact and sprawled regions. *Journal of the American Planning Association*, 76 (3), 363–371. DOI: <http://dx.doi.org/10.1080/01944363.2010.486623>
- Smutek, J. (2012a). Wpływ suburbanizacji w strefie oddziaływania wielkiego miasta na dochody gmin z tytułu udziału w podatku dochodowym od osób fizycznych w Polsce (= Effect of urbanisation in the zone of influence of a great city on the income of communes due to participation in personal income tax in Poland). *Buletyn Rozwój Regionalny i Polityka Regionalna*, 1, 103–121. (in Polish)
- Smutek, J. (2012b). Suburbanizacja, rozwój nie zrównoważony i jego konsekwencje dla wydatków gmin w Polsce (= Suburbanisation, sustainable development, and its consequences for expenditures of communes in Poland). *Handel Wewnętrzny*, 7 (2), 142–153. (in Polish)
- Strzelecki, Z., Kucińska, M. (2006) *Żywiotowe rozprzestrzenianie się metropolii warszawskiej*. In S. Kozłowski (Ed.), *Żywiotowe rozprzestrzenianie się miast. Białystok – Lublin – Warszawa*, pp. 128–129
- Sýkora, L. (1999). Changes in the internal spatial structure of post-communist Prague. *GeoJournal*, 49 (1), 79–89. DOI: <https://doi.org/10.1023/A:100706000411>
- Sýkora, L., Ouředníček, M. (2007). Sprawling post-communist metropolis: commercial and residential suburbanisation in Prague and Brno, the Czech Republic. In E. Razin, Dijst, M., Vázquez, C. (Eds.), *Employment Deconcentration in European Metropolitan Areas: Market Forces versus Planning Regulations*, (pp. 209–233). Dordrecht: Springer.
- Sýkora, L., Stanilov, K. (2014). The Challenge of Postsocialist Suburbanization. In K. Stanilov (Ed.), L. Sýkora (Ed.), *Confronting Suburbanization: Urban Decentralization in Postsocialist Central and Eastern Europe* (pp. 1–32). Chichester: Wiley-Blackwell. DOI: <http://dx.doi.org/10.1002/9781118295861.ch1>
- Śleszyński, P. (2012). Warszawa i obszar metropolitalny Warszawy a rozwój Mazowsza. *Trendy Rozwojowe Mazowsza 8/2012*, p. XX. (in Polish)
- Śleszyński, P. (2018). Społeczno-ekonomiczne skutki chaosu przestrzennego dla osadnictwa i struktury funkcjonalnej terenów (= Socio-Economic Effects of the Spatial Chaos for the Settlement Systems and Functional Land Use Structure). *Studia KPZK PAN* pp. 29– 80. (in Polish)
- Tammaru, T., Kulu, H., Kask, I. (2004). Urbanization, suburbanization and counter-urbanization in Estonia. *Eurasian Geography and Economics*, 45 (3), 212–229. DOI: <https://doi.org/10.2747/1538-7216.45.3.212>
- Tanaś, J., Trojanek, M. (2014). Changes in land use structure in suburban zones in Poland after the 90. *Journal of International Studies*, 7 (3), 81–89. DOI: <https://doi.org/10.14254/2071-8330.2014/7-3/7>
- Topa, G., Zenou, Y. (2015). Neighbourhood and Network Effects. In G. Duranton, J. V. Henderson (Ed.), W. C. Strange (Ed.), *Handbook of regional and urban economics* (Vol. 5, pp. 561-624). Amsterdam: The Netherlands: Elsevier. DOI: <https://doi.org/10.1016/b978-0-444-59517-1.00009-x>
- Węgliński, J. (1988). *Metropolitalna Ameryka (= Metropolitan America)*. Warszawa: Wydawnictwo Wiedza Powszechna, 178 p. (in Polish)
- Zuziak, Z. (2005). Strefa podmiejska w architekturze miasta. W stronę nowej architektoniki regionu miejskiego (= Suburban zone in the architecture of the city). In P. Lorens (Ed.), *Problem suburbanizacji (= Problem of Suburbanisation)* (pp. 17-32). Biblioteka Urbanisty 7, Warszawa. (in Polish)
- Živković, L., Marani, S., Berk, S., Dežman Kete V., Trapani, F., Esposito, G., Špeh, N., Milić, Đ., Živanović, T., Barborič, B. (2015). Towards a monitoring information system for territorial attractiveness and policy management in South East Europe. *Geodetski vestnik*, 59 (4,752–766). DOI: <https://doi.org/10.15292/geodetski-vestnik.2015.04.752-766>



Budzyński T., Jaroszewicz J., Krupowicz W., Majewska A., Sajnog N. (2018). A method for identification of future suburbanisation areas. *Geodetski vestnik*, 62 (3), 472-486. DOI: <https://doi.org/10.15292/geodetski-vestnik.2018.03.472-486>

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